Staphylococcus aureus Enterotoxins Presence from Samples Obtained from the Local Community

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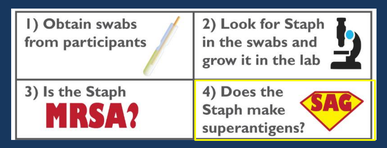
ABSTRACT

The presence of *Staphylococcus aureus* toxins was determined via Polymerase Chain Reaction and Gel Electrophoresis. Results were compared to positive and negative controls.



BACKGROUND

S. aureus, a gram positive cocci bacteria, can be both a pathogen and commensal organism to humans, and is found on the skin, nasal cavity, and in the vaginal canal

. Our study obtained samples from the nasal cavity of volunteers from Concordia University, Saint Paul campus (26.6% carriage rate), and the Minnesota State Fair (26% carriage rate). *S. aureus* produces a variety of toxins that are harmful to humans, and the purpose of this study was to determine if our samples produced some of these toxins (SEC1, TSST-1, alpha toxin, SEA, SEL-X).

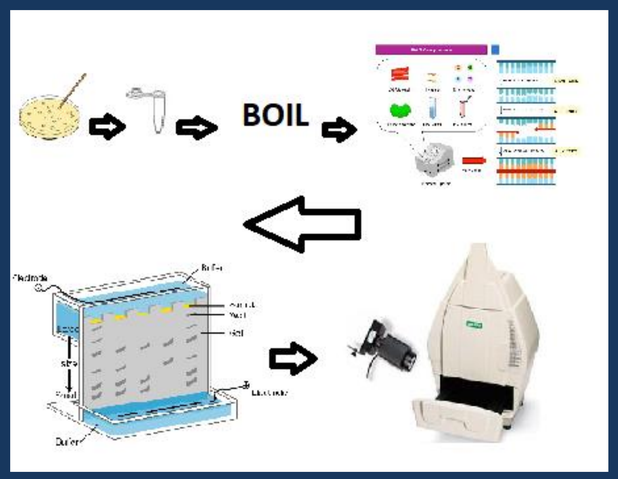
METHODOLOGY

Polymerase Chain Reaction (PCR) was used to amplify the DNA of samples using a repeating process of denaturing, annealing, and synthesis. Each of the different toxins have separate thermocycler programs.

Reagents included in PCR:

- TAQ Polymerase
- Forward and Reverse Primers Specific to the Toxins
- Nuclease Free Water
- DNA from Samples Extracted via Boiling

After PCR, the samples were loaded onto a 2% agarose gel, and were separated by molecular weight via gel electrophoresis and imaged through the use of Bio- Rad Gel Imager.



Staphylococcus aureus Toxins are Among us!

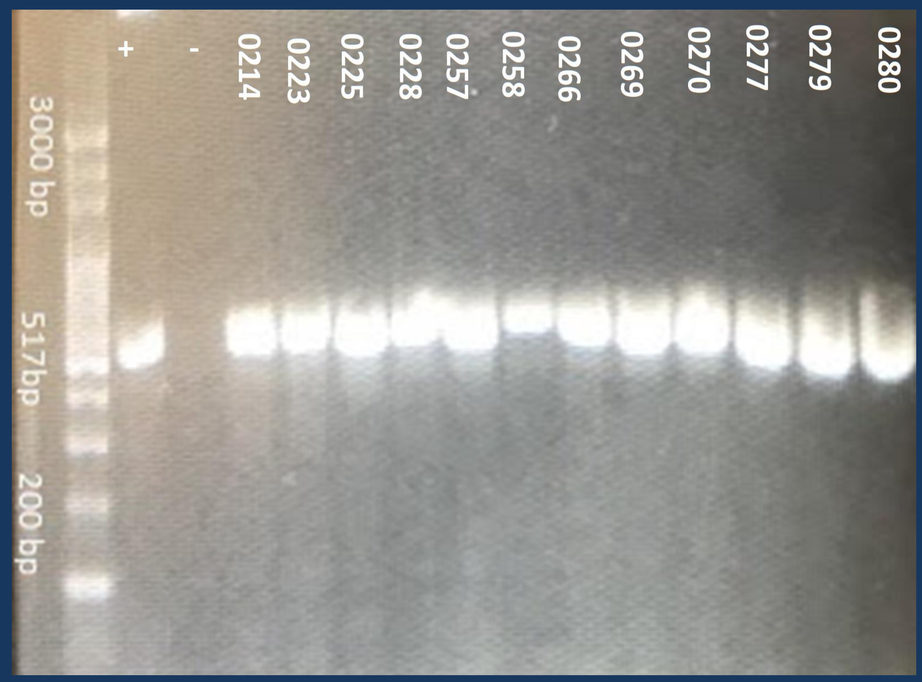


Figure 1:Gel electrophoresis analysis of PCR isolates (numbered on top) confirming the presence of alpha toxin (517 bp) as the isolates showed similar banding pattern to the control .

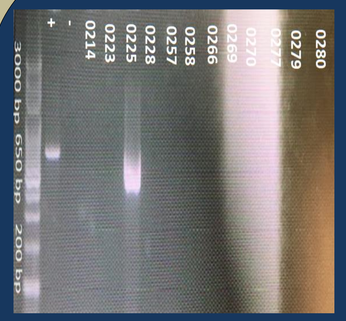


Figure 2:Gel electrophoresis analysis of PCR isolates (numbered on top) confirming the presence of SEC1 (615 bp) in isolate 0225 compared to the control.

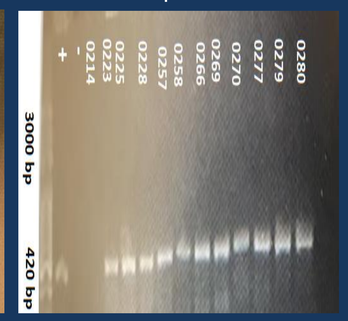


Figure 3:Gel electrophoresis analysis of PCR isolates (numbered on top) confirming the presence of SEL-X (420 bp) in multiple isolates.

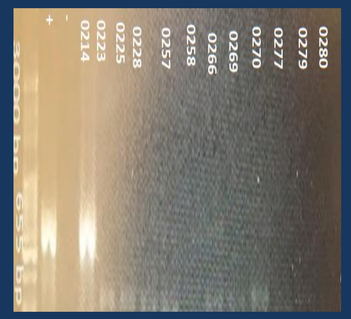


Figure 4: Gel electrophoresis analysis of PCR isolates (numbered on top) confirming the presence of TSST-1 (655 bp) in isolate 0214.

CSP SCIENCE

TOXIN SUMMARY

Alpha Toxin-The most prominent of all *S. aureus* secreted toxins, named for its ability to lyse red blood cells by forming pores in the cells(1). Alpha toxin is most known for its ability to cause sepsis and research suggests alpha toxin has a role in amplifying pathogenicity(1).

SEC1-*Staphylococcus aureus* enterotoxin type C has multiple subtypes. SEC-1, specifically, is associated with patients suffering from Rheumatoid Arthritis(2). Found in synovial fluid, it may play a role in the progression of the disease(2).

SEL-X-*Staphylococcal aureus* enterotoxin like X has unique properties that allow it to interfere with the host's healing of wounds by binding to proteins associated with coagulation (3).

TSST-1- Toxic Shock Syndrome Toxin 1 is one of the most lethal toxins produced by *Staphylococcus aureus*, causing organ failure and skin desquamation(4). 40% of TSST-1 cases are associated with menstruation(4).

SEA- SEA is responsible for around 80% of food poisoning cases in the United States, and the intestines are a site of emetic action for this toxin(5).

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